

Addendum H. Solid Waste Operational Complex (SWOC) Closure Units  
H.1. Low Level Burial Ground (LLBG) Trenches 31 and 34  
H.1.A. FS-1 Outdoor Container Storage Area

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**ATTACHMENT A. VISUAL/PHYSICAL INSPECTION SUPPORTING  
DOCUMENTATION**

**ATTACHMENT B. VISUAL SAMPLING PLAN SOFTWARE REPORT FOR FS-1**

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## TERMS

CFR	Code of Federal Regulations
CHPRC	CH2M Hill Plateau Remediation Company
COPC	Constituent of Potential Concern
CWC	Central Waste Complex
DOE	U.S. Department of Energy
DQA	data quality assessment
DWMU	dangerous waste management unit
EPA	Environmental Protection Agency
HASQARD	<i>Hanford Analytical Services Quality Assurance Requirements Document</i>
HFFACO	Hanford Federal Facility Agreement and Consent Order
HEIS	Hanford Environmental Information System
LDR	Land Disposal Restriction
LLBG	Low Level Burial Ground
LLW	Low Level Waste
MLLW	mixed low-level waste
MTCA	Model Toxics Control Act
OUG	operating unit group
PPE	Personal Protective Equipment
PQL	practical quantitation limit
SAP	Sample and Analysis Plan
SWOC	Solid Waste Operational Complex
TSCA	<i>Toxic Substances Control Act of 1976</i>
TSD	treatment, storage, and disposal
QC	quality control
WAC	Washington Administrative Code

## 1.0 INTRODUCTION

This addendum discusses closure activities for the Low Level Burial Ground (LLBG) Trenches 31 & 34 Operating Unit Group (OUG) FS-1 outdoor container storage area dangerous waste management unit (FS-1 outdoor container storage area). This dangerous waste management unit (DWMU) is located along the south side of Trench 34. [1] Closure activities are begun when the U.S. Department of Energy (DOE) has determined that no further waste management activities will take place in a unit. DOE has agreed through a Consent Agreement and Final Order with EPA to close this DWMU. The closure will be performed in accordance with the included schedule. This closure plan complies with Washington Administrative Code (WAC) 173-303-610 and [2] represents the baseline for closure.

[3] The FS-1 outdoor container storage area will be closed according to current applicable WAC 173-303 regulations, DOE requirements, and best management practices. [4] Closure of this DWMU will be integrated with the overall cleanup activities performed under the Hanford Federal Facility Agreement and Consent Order (HFFACO) (Permit Attachment 1).

### 1.1. Facility Description

The Hanford Facility, located in southeastern Washington State, is owned by the U.S. Government, managed and operated by DOE. Dangerous waste and mixed waste (containing both dangerous and radioactive components) are generated and managed at the Hanford Facility.

[5] The LLBG Trenches 31-34-94 OUG as defined in the Part A consists of Trenches 31, 34 and 94 and associated DWMUs (Figure 1 and Figure 2). Trenches 31 and 34 are large rectangular engineered RCRA compliant landfills in the southwest corner of the LLBG 218-W-5 Burial Ground operated as units for disposal of treated and land disposal restriction (LDR) compliant dangerous and/or mixed waste. [6] Trench 94 is located in the 200 East Area of the Hanford Facility in the northeast corner of the 218-E-12B Burial Ground and covers a total area of approximately 49 hectares. Trench 94 is designed for the receipt and final disposition of decommissioned, defueled, reactor compartments. Included in the LLBG Trenches 31-34-94 OUG are the Trenches 31 and 34 Waste Storage & Treatment Pad DWMUs and the FS-1 outdoor container storage area. The Waste Storage & Treatment Pad DWMUs associated with the trenches and LLBG Trenches 31-34-94 OUG will continue to be operated and will not be closed under this closure plan.

### 1.2. Unit Description








The FS-1 outdoor container storage area (Figure 2) was originally constructed for the temporary storage of non-mixed low-level waste (LLW) containers from the 300 Area prior to their disposal into the LLBG Trench 34. [7] After these activities were completed in July 2005, the FS-1 outdoor container storage area was used for the storage of LLW, mixed low-level waste (MLLW), and

# Summary of Comments on LLBG Trenches 31-34-94 FS-1 Closure Plan\_DRAFT-DBB.pdf

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-  Number: 1 Author: DBARTUS Subject: Highlight Date: 8/15/2013 3:59:58 PM  
This language is NOT consistent with the WAC requirements for notice of intent to close. See WAC 173-303-610(3)(c)(i)
- 
-  Number: 2 Author: DBARTUS Subject: Highlight Date: 8/15/2013 4:00:24 PM  
Not just the baseline, but the enforceable compliance requirement.
- 
-  Number: 3 Author: DBARTUS Subject: Highlight Date: 8/15/2013 4:02:57 PM  
As noted in EPA comments on re-issue permit closure requirements, closure must occur according to the approved closure plan in the permit. EPA strongly encourages Ecology to consider early communication of closure conceptual agreement principles to DOE-RL to address these sorts of issues.
- 
-  Number: 4 Author: DBARTUS Subject: Highlight Date: 8/15/2013 4:03:52 PM  
What does this mean? Closure of the FS-1 unit will occur on its own without any particular integration or relation to HFFACO requirements. EPA recommends that this text be deleted.
- 
-  Number: 5 Author: DBARTUS Subject: Highlight Date: 8/15/2013 4:06:24 PM  
At least with respect to the re-issue permit, Trenches 31/34 and Trench 94 are administratively organized into separate unit groups.
- Is there any reason to even mention Trench 94 in this closure plan?
- 
-  Number: 6 Author: DBARTUS Subject: Highlight Date: 8/15/2013 4:07:10 PM  
Probably best to simply delete this text. See the previous comment.
- 
-  Number: 7 Author: DBARTUS Subject: Highlight Date: 8/16/2013 1:05:32 PM  
Based on this language, MLLW and TSCA-regulated waste could have been stored in this unit as early as July, 2005. However, the period covered by documented record reviews begins no earlier than January, 2007. This is a potentially significant data gap during which there is no documentation of records.
- Section 1.2.1 does state "MLLW and TSCA waste occurred from November 2007 through January 2008. " However, the potential for disconnect between the highlighted text and Section 1.2.1 needs to be reconciled.

<sup>1</sup>Toxic Substances Control Act of 1976 low-level waste (TSCA LLW) containers prior to disposal into the LLBG Trenches 31 & 34 OUG.

The FS-1 outside container storage area is a gravel covered, rectangular area approximately 14 m (15 yd) wide by 69 m (75 yd) long equaling a total storage area of 966 m<sup>2</sup> (1,125 yd<sup>2</sup>). The perimeter of the storage area is defined by metal T-posts with the corner posts holding signage designating the area as the FS-1 outdoor container storage area. There are no structures or equipment located at the storage area.

Table 1-1 contains the FS-1 outdoor container storage area location coordinates:

Table 1-1. FS-1 Outdoor Container Storage Area <sup>2</sup> GPS Coordinates <sup>a</sup>		
GPS Location	Latitude	Longitude
Northwest T-Post	46.5597505	119.6405786
Southwest T-Post	46.5596324	119.6405794
Northeast T-Post	46.5597475	119.6397850
Southeast T-Post	46.5596340	119.6397881
GPS – Global Positioning System		
<sup>a</sup> = GPS locations were taken on 08/05/2013		

### 1.2.1. Maximum Waste Inventory

<sup>3</sup>The maximum inventory of dangerous waste stored on the FS-1 outdoor container storage area over its lifetime included four MLLW containers with a total volume of 12.03 m<sup>3</sup> (15.73 yd<sup>3</sup>) and seven TSCA LLW waste containers with a total volume of 4.85 m<sup>3</sup> (171.3 yd<sup>3</sup>). MLLW and TSCA waste occurred from November 2007 through January 2008. The MLLW stored at the FS-1 outdoor container storage area was either treated to meet LDR requirements prior to being stored in this area or the waste met the LDR requirements at the time of generation. Details on the waste containers are presented in Section 3.3 of this closure plan.

## 2.0 CLOSURE PERFORMANCE STANDARD

Closure performance standards for the FS-1 outdoor container storage area will be based on requirements found in WAC 173-303-610(2), which include the following:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate as required, jeopardy to human health and the environment; post-closure escape of dangerous waste, dangerous constituents, leachate, or contaminated run-off; and dangerous waste decomposition products to the ground, surface water, groundwater, and air.



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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 1:02:17 PM

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 Number: 2 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:10:20 PM

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It is not appropriate to cite "GPS Coordinates." The Global Positioning System does not itself establish a coordinate system. Rather, GPS is a measurement system that can report geospatial information within existing coordinate systems.

If coordinates are specified as lat/long, then the particular datum used should be specified.

 Number: 3 Author: DBARTUS Subject: Highlight Date: 8/16/2013 2:31:12 PM

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While this information may be accurate, Ecology should obtain verification of the basis for the conclusions stated in this section. EPA notes that during various inspections conducted of Trench 31/34 container storage units, significant number of containers have been documented in the FS-1 storage unit, including dates subsequent to January, 2008. EPA is including a photolog from April, 2009 documenting a considerable number of containers in the FS-1 unit - see page 13, right-hand photograph. This photograph is cited as being "Waste south of Trench 31," which is technically correct, but the area appears to be immediately south of Trench 34, not Trench 31. Although this photo does not provide a basis to conclude that any of the containers are other than low-level wastes, the fact that operations appear to have continued well after the January 2008 date support EPA's recommendation that Ecology further investigate the dates of regulated activities at the FS-1 unit.

Even if the containers documented in the photolog are not mixed waste, the number of containers suggests that there may be environmental issue associated with their storage. At a minimum, the closure plan should acknowledge the full range of operations and wastes stored, regardless of whether the wastes were subject to regulation under dangerous waste container storage rules.

- Return the land to the appearance and use of surrounding land areas to the degree possible, given the nature of previous dangerous waste activity.

These performance standards are addressed in the Sections 2.1 and 3.9.

## 2.1. Clean Closure Levels

1 FS-1 outdoor container storage area will be clean closed. In accordance with WAC 173-303-610(2)(b)(i), for soils, the clean closure levels will be the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the Model Toxics Control Act (MTCA) Cleanup Regulations WAC 173-340-700 through -760, excluding WAC 173-340-745). These numeric clean-up levels will be calculated according to MTCA Method B unrestricted use standards current at the time of closure.

## 3.0 CLOSURE ACTIVITIES

As a storage unit, the basis of a clean closure determination for the FS-1 outdoor container storage area will be based on a review of the operational history, review of the FS-1 outdoor container storage area operating records, and a visual/physical inspection of the area to verify that no releases or spill of dangerous or mixed waste have occurred. Subsequently, soil sampling and analysis will be conducted to demonstrate that clean closure numeric levels have been achieved.

Closure activities required to achieve and verify clean closure of soil are as follows:









- Remove all dangerous waste inventory (Completed. See Section 3.2)
- Verify waste container storage, operating and inspection records (Completed. See Section 3.3.)
- Perform a visual/physical inspection of gravel and visible surface soil 2 Completed. See Section 3.3.)
- Perform soil sampling and analysis to confirm clean closure standards.

### 3.1. Health and Safety Requirements

3 Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. 4 Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. 5 Personnel will be equipped with appropriate personal protective equipment (PPE) and will be trained in applicable safety and environmental procedures. 6 Field operations will be performed in accordance with health and safety requirements and appropriate procedural requirements.

### 3.2. Removal of Wastes and Waste Residues

No dangerous or mixed waste is currently stored at the FS-1 outdoor container storage area. The waste was removed in 7 September 2008 and 8 dangerous or mixed waste is no longer being accepted





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-  Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:57:31 PM  
Why does the closure plan state closure performance standards "will be" calculated according to MTCA Method B current at the time of closure? The closure plan must specify each dangerous constituent for which closure performance standards are to be established, and the corresponding numerical closure performance standard (which it does - please include a reference to Section 3.3 and Table 3.4). As a general principle, the closure performance standards must be current as of the date the permit is modified to establish the closure plan in the permit, not at some unspecified time in the future. See WAC 173-303-806(3).
- 
-  Number: 2 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:37:52 PM  
As noted in the document FS-1 closure presentation, any work already completed prior to Ecology approval of the closure plan through the permit modification process was conducted "at risk." The Permittees must recognize that if Ecology establishes closure requirements that differ from work conducted "at risk," they will be required to redo such work in order to be able to certify closure according to the approved closure plan.
- 
-  Number: 3 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:39:06 PM  
Agreed in principle. Are closure activities documented in sufficient detail in the closure plan that Ecology can make a determination that, when approved, the documented closure activities will ensure safety of personnel and the surrounding environment?
- 
-  Number: 4 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:40:26 PM  
What qualifications or training are associated with "qualified personnel?" Are training requirements specified in the permit? What is meant by "...will perform any necessary closure activities?" All closure activities documented in the approved closure plan are by definition necessary and enforceable.
- 
-  Number: 5 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:41:23 PM  
Where is "appropriate personal protective equipment" documented? Where are the specific training requirements documented?
- 
-  Number: 6 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:41:55 PM  
Where is the corresponding health and safety plan documented?
- 
-  Number: 7 Author: DBARTUS Subject: Highlight Date: 8/16/2013 4:51:35 PM  
The dates of waste removal are inconsistent. Section 1.2.1 states that waste storage ceased in 1/2008, not 9/2008. Attachment 8 also cites September, 2008.
- 
-  Number: 8 Author: DBARTUS Subject: Highlight Date: 8/16/2013 2:32:20 PM  
As noted in a previous comment, wastes appear to have been accepted, or at least continued to be stored, in the FS-1 unit well after September, 2008.

1 at this area. 2 In the future, the FS-1 outdoor container storage area will not be used for dangerous or mixed waste storage.

### 3.3. FS-1 Outdoor Storage Area Operating Records Review

To support the development of this closure plan and the associated sample and analysis plan (SAP) (Section 3.6) a review of the FS-1 outdoor container storage area operating records was completed (Table 3-1). The records examination included the following RCRA operating record documents: facility operating logbooks, weekly inspections, and spill reports. The RCRA operating record documents reviewed focused on periods of time during active dangerous waste storage.


RCRA operating record documents for the MLLW waste containers stored in the FS-1 outdoor container storage area were reviewed to determine the constituents of potential concern (COPCs) to be included in the closure plan SAP. 3 RCRA operating record documents indicate that all COPCs in the dangerous waste stored in the FS-1 outdoor container storage area were LDR compliant (either treated to meet LDR requirements or were below the LDR-regulated levels at the time of generation) (Table 3-2). 4 The facility operating records review confirmed no leaks or releases of dangerous, mixed or TSCA waste occurred in the FS-1 outdoor container storage area and the visual/physical inspection did not identify any staining therefore, only confirmation sampling and analysis to verify clean closure will be performed.

	Number: 1	Author: DBARTUS	Subject: Highlight	Date: 8/16/2013 2:31:35 PM
	Number: 2	Author: DBARTUS	Subject: Highlight	Date: 8/15/2013 6:43:36 PM
EPA notes that the FS-1 storage area does not comply with the technical requirements for storage for disposal of PCB wastes. To this end, EPA recommends that the highlighted text be modified to indicate that the FS-1 storage area will not be used for storage for disposal of wastes regulated for disposal under TSCA.				
	Number: 3	Author: DBARTUS	Subject: Highlight	Date: 8/16/2013 2:43:21 PM
Given that a number of characteristic waste codes are associated with mixed waste stored in the FS-1 unit, this implies that the wastes may be subject to 40 CFR 268.48 treatment standards for underlying hazardous constituents (UHCs). Did the evaluation of compliance with LDR treatment standards associated with the highlighted text consider UHCs?				
	Number: 4	Author: DBARTUS	Subject: Highlight	Date: 8/16/2013 2:43:59 PM
See other comments on similar text.				


**Table 3-1. Operating Records Review Summary**

Document Number	Facility	Start Date	End Date	Items of Concern Noted	Date of Corrective Actions	Log Book Page Number/ Inspection Sheet Page
HNF-N-450 85 (Solid Waste Storage & Disposal/Waste)	LLBG 218W5	07/10/2007	12/06/2008	No	NA	NA
SW-040-041 Inspect Low-Level Burial Grounds, Checklist 2 – LLBG Weekly RCRA Inspections for Trenches 31 and 34 in 218-W-5 (Trench 34)	LLBG 218W5	01/01/2007	09/23/2008	No	NA	NA
SW-040-041 Inspect Low-Level Burial Grounds, Checklist 2 – LLBG Weekly RCRA Inspections for Trenches 31 and 34 in 218-W-5 (Trench 34)	LLBG 218W5	24/02/2008	04/02/2008	Yes <sup>a</sup>	05/22/2008	23
LLBG – Low-Level Burial Grounds						
NA – Not Applicable						
<sup>a</sup> = The container noted as an item of concern was not a dangerous waste container. No evidence of leaking was noted. See Attachment A for details.						

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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 1:00:49 PM  
If waste was removed in September, 2008, why were records in this line item not available or considered from February through September 2008?

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 Number: 2 Author: DBARTUS Subject: Highlight Date: 8/16/2013 1:01:22 PM  
If waste was removed in September, 2008, why were records in this line item not available or considered from April through September 2008?


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**Table 3-2. Mixed Waste Container Data**

Container ID	Facility ID	Storage Unit	Waste Package Type	Package Volume (m <sup>3</sup> )	Waste Type	Moved In Date	Moved Out Date	Assigned Waste Code	LDR Status
MW07700211	LLBG 218W5	FS1	DOT METAL BOX	2.72	MLLW	11/29/2007	11/29/2007	D005, D006, D007, D008, D009, D011, D035, F001, F002, F003	TREATED TO MEET LDR STANDARDS
MW07700604	LLBG 218W5	FS1	DOT METAL BOX	2.72	MLLW	11/29/2007	11/29/2007	D007, D008, D009, D035, F002, F003, F005	TREATED TO MEET LDR STANDARDS
MW077006551	LLBG 218W5	FS1	DOT METAL BOX	6.38	MLLW	11/29/2007	11/29/2007	D007, D008, D009, D011, D026, D035, D037, F001, F002, F003, F004, F005, P029, P030, P098, P106, P120, U002, U031, U108, U123, U133, U154, U159, U162, U210, U239	TREATED TO MEET LDR STANDARDS
0020830	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	MLLW	12/10/2007	09/10/2008	WT02	LDR COMPLIANT AT THE POINT OF GENERATION
0015656	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015684	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015687	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015717	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0015760	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA
0017284	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA



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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:31:43 PM  
Do the same move-in and move-out dates make sense? Section 1.2.1 states that MLLW was stored from November 2007 through January 2008.

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**Table 3-2. Mixed Waste Container Data**

Container ID	Facility ID	Storage Unit	Waste Package Type	Package Volume (m <sup>3</sup> )	Waste Type	Moved In Date	Moved Out Date	Assigned Waste Code	LDR Status
PNL-00-139	LLBG 218W5	FS1	DOT 55-GAL DRUM	0.21	TSCA-LLW	12/10/2007	01/14/2008	NA	NA

### 3.4. Identifying and Managing Contaminated Environmental Media

The records review outlined in Section 3.3 and a visual/physical inspection **did not identify any releases of dangerous waste or the presence of potentially contaminated environmental media at the FS-1 outdoor container storage area.** Environmental media removal is not anticipated.

### 3.5. Confirming Clean Closure

The FS-1 outdoor container storage area will be clean closed. A review of applicable RCRA operating record documents was completed to determine the release history of the area. Records verification included facility operating record/logbooks and weekly unit inspections as outlined in Section 3.3. In addition to records verification, a visual/physical inspection of the area was performed to identify any dangerous waste related staining of the gravel or visible surface soil. The visual/physical inspection and records reviews were completed on July 31, 2013 and documented in Attachment A. Supporting documentation for these activities includes the FS-1 Daily Operating Log Book Review sheet, LLBG 218-W-5, FS-1 Outdoor Container Storage Area walk down inspection sheet, the LLBG Trench 34/FS-1 Weekly Dangerous Waste Inspection Checklist Review and any additional supporting information.

All dangerous waste has been previously removed and there have been no documented spills or releases of dangerous waste. **Therefore, post-closure escape of dangerous waste and any associated dangerous waste constituents, leachate, contaminated run-off, and dangerous waste decomposition products to the ground, surface water, groundwater, or air is not possible.**

The FS-1 outdoor container storage area is adjacent to LLBG Trench 34, **which is actively receiving waste for storage and/or disposal.** Sampling will be conducted to confirm that soil unrestricted use cleanup standards have been achieved. Pending analytical results confirming clean closure level of COPCs, the gravel surface of the container storage area will remain in place.

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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:48:13 PM

These two statements are overly broad. The highlighted text should document that the records review did not identify any documented releases of dangerous waste. It is possible that undocumented spills/releases occurred. Similarly, the text should state that visual examination did not identify any visual evidence of contamination. It is possible that releases occurred that did not leave visual traces some six years after the start of storage.

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 Number: 2 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:50:06 PM

This text is overly broad. Even though there are no documented spills/releases, and no visual evidence of spills/releases, the potential for post-closure escape of DW/dangerous constituents cannot be totally ruled out.

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 Number: 3 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:52:16 PM

If Trench 34 is receiving waste for storage, it is doing so illegally. This sentence should read "The FS-1 outdoor container storage area is adjacent to LLBG Trench 34 and the associated load/unload/storage pad, which are actively receiving waste for disposal and storage, respectively.

### 3.6. Sampling and Analysis Plan

#### 3.6.1. Purpose

The purpose of the SAP is to assist in the determination that clean closure levels have been achieved for the FS-1 outdoor container storage area.

Sampling and analysis of the soil will be conducted to confirm that clean closure cleanup levels have been achieved at the FS-1 Outdoor Storage Area. All sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, the American Society for Testing and Materials Annual Book of ASTM Standards, and other EPA-approved methods. Sampling and analysis activities will meet applicable requirements in SW-846, the ASTM standards, EPA approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document (HASQARD)*.

#### 3.6.2. COPCs and Target Analytes

The COPCs and target analytes were determined by reviewing the waste management records of the dangerous waste stored in the FS-1 outdoor container storage area. See Table 3-3 for the target analyte list and associated analytical methods.



Number: 1 Author: DBARTUS Subject: Highlight Date: 8/15/2013 6:54:21 PM

At least with respect to RCRA, EPA no longer "approves" analytical methods. Subsequent to the Methods Innovation Rule, EPA establishes guidance for analytical methods, except for those that are associated with "method-defined parameters."

Table 3-3. Target Analyte List				
Target	Justification/Rationale	Retain as Target Analyte in this SAP for:		Analytical Method
		RCRA Characterization	Waste Management	
Barium (D005)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 6010
Cadmium (D006)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 6010
Chromium (D007)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 6010
Lead (D008)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 6010
Mercury (D009)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 7471 or 200.8
Silver (D011)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 6010
Cresol (D026)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 8270
Methyl Ethyl Ketone (MEK) (D035)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 8260
Pentachlorophenol (D037)	Identified as a COPC based on waste management records.	Yes	Yes	SW-846 Method 8270
Spent Halogenated Solvents (F001, F002)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
Spent Non-Halogenated Solvents (F003 - F005)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
Methyl methacrylate (I,T) (U162)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260

Table 3-3. Target Analyte List				
Target	Justification/Rationale	Retain as Target Analyte in this SAP for:		Analytical Method
		RCRA Characterization	Waste Management	
Ethene, tetrachloro- (U210)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
Benzene, dimethyl (I) (xylene) (U239)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
Copper Cyanide (P029)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 9010/9012/9013/9014
Cyanides (P030)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 9010/9012/9013/9014
Potassium cyanide (P098)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 9010/9012/9013/9014
Sodium cyanide (P106)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 9010/9012/9019014
Vanadium oxide (P120)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 6010/200.8
Acetone (U002)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
1-Butanol (I) (U031)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
1,4-Diethyleneoxide (U108)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
Formic Acid (U123)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Modified 9056A or Modified 300.0
Hydrazine (R,T) (U133)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260

Table 3-3. Target Analyte List				
Target	Justification/Rationale	Retain as Target Analyte in this SAP for:		Analytical Method
		RCRA Characterization	Waste Management	
Methanol (I) (U154)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
2-Butanone (I,T) (U159) (MEK)	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8260
Polychlorinated biphenyls	Identified as a COPC based on waste management records.	No	Yes	SW-846 Method 8082

### 3.6.3. Project Schedule

Confirmation closure sampling and analysis will be performed during FS-1 outdoor container storage area closure activities.




### 3.6.4. Project Management

CH2M Hill Plateau Remediation Company (CHPRC), or an approved subcontractor, is responsible for planning, coordinating, sampling, preparation, packaging, and shipping samples to the laboratory.

### 3.6.5. Sampling Design

Sample location will be determined using an area-wide grid sampling method run in the Visual Sample Plan software (VSP). The FS-1 outdoor container storage area GPS coordinates were entered into VSP to determine the locations and number of samples required to achieve a 95% confidence interval. Using a rectangular grid method, the VSP software determined ten samples are required to achieve a 95% confidence interval. The ten samples will be taken from the node locations indicated by the VSP software and will be assigned sample location IDs and sample numbers using the Hanford Environmental Information System (HEIS). Grid sampling is further defined below. Facility records confirmed that no dangerous waste has been released to the FS-1 outdoor container storage area and no waste related staining is present therefore judgmental sampling will not be performed.



	Number: 1	Author: DBARTUS	Subject: Highlight	Date: 8/15/2013 6:56:53 PM
This should specify whether PCBs are to be evaluated on the basis of individual congeners, or as Aroclor mixtures.				
	Number: 2	Author: DBARTUS	Subject: Highlight	Date: 8/16/2013 11:04:11 AM
This is a very different statistical test than a comparison of the sample mean to the decision criteria, as discussed in Attachment B. Why the discrepancy?				
	Number: 3	Author: DBARTUS	Subject: Highlight	Date: 8/16/2013 11:04:34 AM
See previous comments regarding this language.				

**1** **Grid Sampling.** In grid sampling, samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and to infer means, percentiles, or other parameters, and is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

### **3.6.6. Sampling Methods and Handling**

Grab sample matrix will consist of gravel and/or soil collected in pre-cleaned sample containers taken at a depth of 0-6 inches below ground surface. Grab samples will be collect directly into containers at the chosen node sample locations. **2** To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling.

Sample container, preservation, and holding time requirements are specified in Table 3-5 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the sampling authorization form and the chain-of-custody form.

**3** Sampling equipment will be decontaminated in accordance with approved SW-846 sampling equipment decontamination protocols. To prevent potential contamination of the samples, care will be taken to use decontaminated equipment for each sampling activity.

Level I EPA pre-cleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits.


The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or the sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:


- Sampling Authorization Form
- HEIS number
- Sample collection date and time
- Analysis required
- Preservation method (if applicable)
- Sample authorization form number

In addition, sample records must include the following information:


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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 2:34:00 PM  
See comments in Addendum B regarding grid sampling.

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 Number: 2 Author: DBARTUS Subject: Highlight Date: 8/16/2013 2:53:19 PM  
Sampling must be performed according to the closure plan and its associated sampling and analysis plan as established in the permit. To be sure, what is provided to Ecology as a permit modification request can and should reflect established sampling practices, procedures and requirements to the extent that they apply to verification of compliance with closure standards at the FS-1 unit, but closure activities must be according to the approved closure plan, not requirements or procedures outside of the permit.

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 Number: 3 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:09:45 PM  
SW-846 does not document equipment decontamination protocols. Even if it did, SW-846 is guidance (at least from an EPA perspective) other than for method-defined parameters. Further, Chapter 1 of SW-846 notes that in the project-specific QA/QC plan:

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"The procedures describing decontamination of field equipment before and during the sample collection process should be specified. These procedures should include cleaning materials used, the order of washing and rinsing with the cleaning materials, requirements for protecting or covering cleaned equipment, and procedures for disposing of cleaning materials."

The sampling and analysis plan and QAPP must explicitly document the equipment decontamination procedures that will be used, including applicable QA/QC procedures.

- Analysis required
- Source of sample
- Matrix (water, soil, etc.)

Sample custody will be maintained in accordance with **Existing Hanford Site protocols** to ensure the maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure sample integrity is maintained.

All waste (including unexpected waste) generated by sampling activities will be managed in accordance with applicable regulations and approved procedures.

### *3.6.7. Analytical Methods*

All analyses and testing will be performed consistent with **The contractor and approved laboratory agreements, laboratory analytical procedures, and HASQARD**. The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a COPC is detected at or above clean closure level but less than the PQL of the analytical method Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Analytical methods and performance requirements associated with the COPCs are outlined in Table 3-4.




### *3.6.8. Quality Control*

Quality Control (QC) procedures will be followed in the field and laboratory to ensure that reliable data are obtained. Field and laboratory QC samples will be collected to evaluate the potential for cross-contamination, provide information pertinent to field sampling variability and laboratory performance. Field blanks are typically prepared using high purity reagent water. Laboratory QC samples estimate the precision and bias of the analytical data. The QC samples and the required frequency for collection are presented below. Sampling activities are anticipated to take one day to complete.

**Field QC samples will include one each of the following sample types:**

- full trip blank
- field transfer blank
- equipment rinsate blank (unless disposable equipment is used)
- field duplicate

Laboratory QC samples will include the following types of samples run at the frequency specified in approved laboratory analytical procedures:


- 
-  Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:11:10 PM  
Please include a specific reference to these protocols. Otherwise, neither regulatory agencies nor the public can evaluate them.
- 
-  Number: 2 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:12:08 PM
- 
-  Number: 3 Author: DBARTUS Subject: Highlight Date: 8/16/2013 2:36:15 PM  
The sampling and analysis plan must state whether these blanks are per analytical method, class of parameters (VOCs, SVOCs, metals, etc.), what the rinsate fluid is, and so on.

- Method blanks
- Matrix spike
- Matrix Duplicate or matrix spike duplicate
- Laboratory control samples
- Blank spike
- Surrogates (as required)

**Table 3-4. Soil Analytical Performance Requirements**

CAS Number	Analyte	Analytical Method	Action Level <sup>a</sup> (mg/kg)		Required Detection Limit (mg/kg)	Accuracy Req't (% Recovery) <sup>b</sup>	Precision Req't (RPD) <sup>b</sup>
			Carcinogen	Non-carcinogen			
7440-39-3	Barium	SW-846 Method 6010	N/A	16,000	2.0	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	N/A	80	0.5	±30	≤30
7440-47-3	Chromium	SW-846 Method 6010	11/A	120,000	1.0	±30	≤30
7439-91-1	Lead	SW-846 Method 6010	N/A	250	5.0	±30	≤30
7439-97-6	Mercury	SW-846 Method 7471 or 200.8	N/A	24	0.2	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	N/A	400	1.0	±30	≤30
108-39-4	<i>m</i> -cresol	SW-846 Method 8270	N/A	4000	0.66	N/A <sup>c</sup>	≤20
95-48-7	<i>o</i> -cresol	SW-846 Method 8270	N/A	4000	0.33	N/A <sup>c</sup>	≤20
106-44-5	<i>p</i> -cresol	SW-846 Method 8270	N/A	400	0.33	N/A <sup>c</sup>	≤20
78-93-3	Methyl Ethyl Ketone (MEK)(2-Butanone)	SW-846 Method 8260	N/A	48,000	0.01	N/A <sup>c</sup>	≤20
87-86-5	Pentachlorophenol	SW-846 Method 8260	8.33	2,400	0.33	N/A <sup>c</sup>	≤20
N/A	2pent Halogenated Solvents	SW-846 Method 8260	na	na	na	N/A <sup>c</sup>	≤20
N/A	Spent Non-Halogenated Solvents	SW-846 Method 8260	na	na	na	N/A <sup>c</sup>	≤20
80-62-6	Methyl methacrylate	SW-846 Method 8260	N/A	112,000	0.010	N/A <sup>c</sup>	≤20
127-18-4	Tetrachloroethene	SW-846 Method 8260	1.85	800	0.005	N/A <sup>c</sup>	≤20
108-38-3	<i>m</i> -Xylene	SW-846 Method 8260	N/A	16,000	0.005	N/A <sup>c</sup>	≤20
95-47-6	<i>o</i> -Xylene	SW-846 Method 8260	N/A	16,000	0.005	N/A <sup>c</sup>	≤20

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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:44:34 PM

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These numbers don't make sense. First, unless data are available to document that whatever chromium may be present is exclusively in the trivalent form, it must be assumed that at least some chromium is hexavalent. Therefor, a carcinogen closure performance standard should be specified for chromium.

Second, EPA recognizes that MTCA Method B cleanup levels may be higher or lower than Method A levels. That said, the 120,000 number differs markedly from the 2,000 mg/kg level for the Method A cleanup level for trivalent chromium, or the 19 mg/kg level for hexavalent chromium. At a minimum, Ecology should require that the closure plan document the Method B calculations performed to arrive at the cited numbers so that they can be verified as appropriate for use as closure performance standards for this dangerous waste management unit. EPA notes that some closure performance standards, such as for lead, are in fact consistent with Method A numbers, so it is odd that others differ so markedly.

 Number: 2 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:19:46 PM

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A group of compounds such as spent halogenated solvents should not be specified as COCs, especially considering that no closure performance standards are being specified. Sampling and analysis requirements and closure performance for individual constituents that make up the cited group of constituents must be specified in the closure plan and the sampling and analysis plan.



**Table 3-4. Soil Analytical Performance Requirements**

CAS Number	Analyte	Analytical Method	Action Level <sup>a</sup> (mg/kg)		Required Detection Limit (mg/kg)	Accuracy Req't (% Recovery) <sup>b</sup>	Precision Req't (RPD) <sup>b</sup>
			Carcinogen	Non-carcinogen			
106-42-3	p-Xylene	SW-846 Method 8260	N/A	16,000	0.005	N/A <sup>c</sup>	≤20
57-12-5	Cyanide	SW-846 Method 9010/9012/9013/9014	N/A	48	0.5	±30	≤30
1314-62-1	Vanadium oxide (vanadium pentoxide)	SW-846 Method 6010/200.8	N/A	720	na	N/A <sup>c</sup>	≤30
67-64-1	Acetone	SW-846 Method 8260	N/A	72,000	0.02	N/A <sup>c</sup>	≤20
71-36-3	1-Butanol	SW-846 Method 8260	N/A	8,000	0.1	N/A <sup>c</sup>	≤20
123-91-1	1,4-Diethyleneoxide (1,4-Dioxane)	SW-846 Method 8260	10	2,400	0.5	N/A <sup>c</sup>	≤20
64-18-6	Formic Acid (U123)	Modified 9056A or Modified 300.0	N/A	160,000	na	N/A <sup>c</sup>	≤30
302-01-2	Hydrazine	SW-846 Method 8260	0.333	N/A	na	N/A <sup>c</sup>	≤20
67-56-1	Methanol	SW-846 Method 8260	N/A	40000	1.0	N/A <sup>c</sup>	≤20
1336-36-3	Polychlorinated biphenyl (PCB)	SW-846 Method 8082	3.5	1.6	0.16	N/A <sup>c</sup>	≤20

a. Action levels are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the Model Toxics Control Act (MTCA) Cleanup Regulation (WAC 173-340-740, -747, -and -7490 through -7494). These numeric clean-up levels will be calculated according to MTCA Method B (unrestricted use standards)


b. Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples is also performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analyses.

<sup>c</sup> Determined by the laboratory based on historical data or statistically-derived control limits. Limits are reported with the data. Where specific acceptance criteria are listed, those acceptance criteria may be used in place of statistically derived acceptance criteria.


N/A = not applicable

na = information not available


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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:23:54 PM  
What is the relationship between "action level" and "closure performance standards?"

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 Number: 2 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:27:56 PM  
Why is the required accuracy for p-xylene "not applicable?" If closure decisions for p-xylene (or any other constituent of concern for which closure performance standards have been or should be established) are to be made based on analytical data, then the closure plan and the SAP must document data quality requirements.

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 Number: 3 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:46:54 PM  
See the previous comment as to whether PCBs will be evaluated by individual conveners, by Aroclor mixture, or by the total of all PCBs. EPA understands that MTCA Method B will yield different cleanup levels for the various Aroclor mixtures.

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Also, the method for PCBs should be cited as 8082A.

 Number: 4 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:29:26 PM  
This merely says the data are consistent with historical performance of the laboratory. It says absolutely nothing about whether or not the data are of suitable quantity for their intended decision-making purposes.

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EPA strongly encourages the closure plan and SAP to be based on or supported by a project-specific data quality objectives analysis.

**Table 3-5. Sample Preservation, Container, and Holding Time for Soil Samples**

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Bottle Type	Minimum Sample Size
EPA 6010	Metals	Cool ~4°C	6 months	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	None	28 days	G/P	15 g
EPA 8082	Polychlorinated biphenyl (PCB)	None	1 year	aG	250 g
EPA 8260	Volatile Organic Analytes	Cool ~4°C	14 days	G	5 × 40 g
EPA 8270	Semivolatile Organic Compound	Cool ~4°C	14/40 days	aG	250 g
EPA 300.0	Anions	Cool ~4°C	48 hours/28 days	G/P	120 g
EPA 9012	Cyanide	None	14 days	G/P	120 g
EPA 9056A	Anions	None	48 hours/28 days	G/P	250 g
EPA 9010/9012/ 9013/9014	Cyanide	None	14 days	G/P	15 g
EPA 200.8	Metals by ICP-MS	None	6 months	G/P	10 g

Notes:

For EPA Method 300.0, see EPA-600/4-79-020, *Methods for Chemical Analysis of Water and Wastes*.

For the four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*.

48 hours/28 days = 48 hours for nitrate, nitrite, and phosphate; others, 28 days

aG = amber glass

G = glass

P = plastic

### 3.6.9. Data Validation and Usability

Data will be qualified as appropriate using the contractor's validation procedures and consistent with EPA functional guidelines. Completed data packages will be validated by qualified CHPRC personnel or by a qualified independent subcontractor. Validation will consist of verifying required deliverables, requested versus reported analyses, chain-of-custody documentation, and transcription errors. Validation will also include evaluating and qualifying the results based on holding times, method blanks, laboratory control samples, laboratory duplicates, and chemical and tracer recoveries, as appropriate. All data validation will be documented in data validation reports.

The DQA process will compare completed field sampling activities to those proposed in this SAP and provide an evaluation of the resulting data. The purpose of the evaluation is to determine if quantitative data are of the correct type and are of adequate quality and quantity to meet the project data quality objectives. The DQA will be performed in accordance with the EPA DQA process, EPA/240/B-06/002, Data Quality Assessment: A Reviewer's Guide, EPA QA/G-

9R, and EPA/240/B-06/003, Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S.

#### *3.6.10. Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed*

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to this SAP will be submitted no later than 30 days after the unexpected event as required in WAC 173-303-610(3)(b)(iii). Address minor changes.

### **3.7. Role of the Independent Registered Professional Engineer**

An independent qualified registered professional engineer will be retained and become familiar with the closure activities to provide certification of the closure as required in WAC 173-303-610(6). The resulting engineering report will be retained in the operating record.

### **3.8. Closure Certification**

Within 60 days after completion of closure activities of the FS-1 outdoor container storage area, a Certification of Closure will be provided to Ecology by certified mail, indicating the FS-1 outdoor container storage area has been closed in accordance with WAC 173-303-610(6).

### **3.9. Conditions that will be Achieved when Closure is Complete**


Upon confirmation of clean closure levels through sampling and analysis, the FS-1 outdoor container storage area will remain in an “as-is” state with the gravel remaining in place. The area surrounding the FS-1 outdoor container storage area is an industrial setting and will continue to be used due to the active RCRA compliant landfill operations in the immediate vicinity; therefore, no removal of gravel is necessary and the land will not be restored to its pre-operational appearance. The storage area marking will be removed once the closure activities are completed. A permit modification request will be submitted after clean closure has been confirmed to delete the FS-1 DWMU from the sitewide permit.

After the operations of the LLBG Trenches 31 and 34 have ceased, a RCRA compliant engineered cover will be placed over the trenches. The extent of the cover will also include the FS-1 outdoor container storage area.

## **4.0 CLOSURE SCHEDULE AND TIMEFRAME**

All closure activities will be completed no more than 180 days after the start of closure. Should unexpected circumstances arise and an extension to the 180-day closure activity expiration date be deemed necessary, an extension request will be submitted to Ecology at least 30 days prior to the 180-day expiration date, in accordance with WAC 173-303-610(4)(c). The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, have been and will be taken.

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 Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:48:55 PM

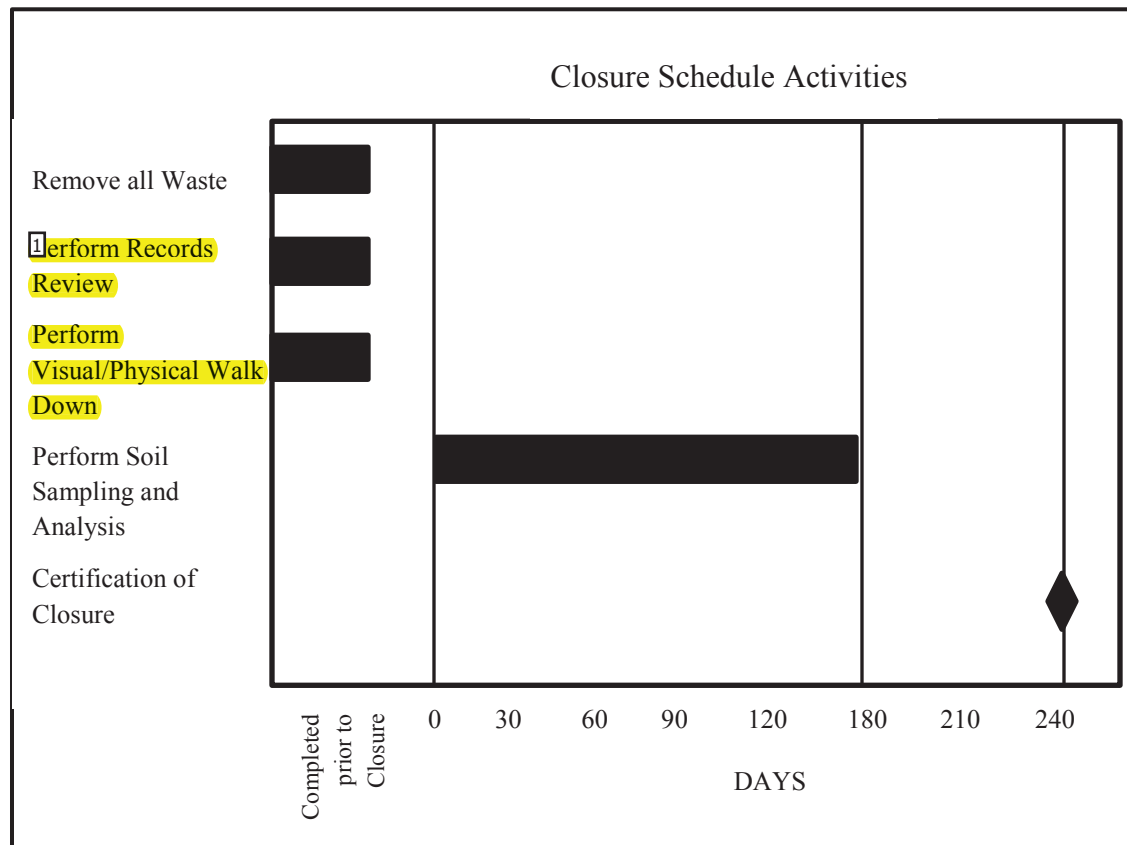
Any changes to the SAP or to the closure plan once approved through the permitting/permit modification process must be made through the permit modification process.

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 Number: 2 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:49:42 PM

Please ensure that this language completely reflects the requirements of WAC 173-303-610(6), including signatory requirements.

Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the FS-1 outdoor container storage area.





Number: 1 Author: DBARTUS Subject: Highlight Date: 8/16/2013 12:52:31 PM

See previous comments regarding these activities being performed "at risk." Should the approved closure plan include requirements that differ from activities performed prior to approval of the closure plan, then the schedule will need to be updated accordingly.



## 5.0 FIGURES

Figure 1: Trenches 31 and 34 Operating Unit Group



Figure 2: Trench 94



99110141-03CN  
Photo Taken 1999



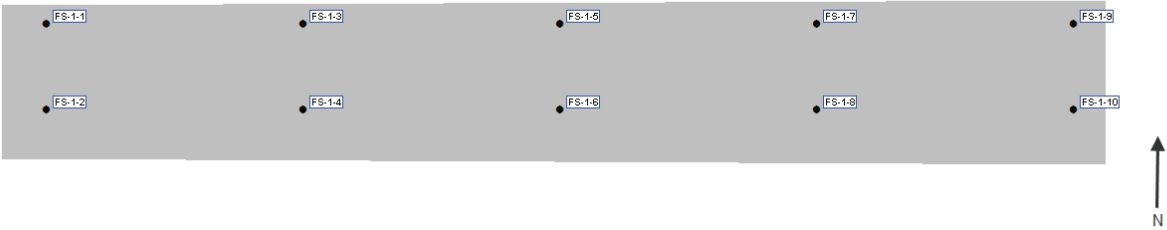
Figure 3: FS-1 Outdoor Container Storage Area



Date pictures

Figure 4: FS-1 Outdoor Container Storage Area VSP Sampling Grid GPS Coordinates and Associated Map

X Coord	Y Coord	Label	Type
119.639817	46.559671	FS-1-2	Systematic
119.640002	46.559671	FS-1-4	Systematic
119.640186	46.559671	FS-1-6	Systematic
119.640371	46.559671	FS-1-8	Systematic
119.640556	46.559671	FS-1-10	Systematic
119.639817	46.559732	FS-1-1	Systematic
119.640002	46.559732	FS-1-3	Systematic
119.640186	46.559732	FS-1-5	Systematic
119.640371	46.559732	FS-1-7	Systematic
119.640556	46.559732	FS-1-9	Systematic



**ATTACHMENT A RECORDS REVIEW AND VISUAL/PHYSICAL INSPECTION  
DOCUMENTATION**

**ATTACHMENT B. VISUAL SAMPLING PLAN SOFTWARE REPORT FOR FS-1**